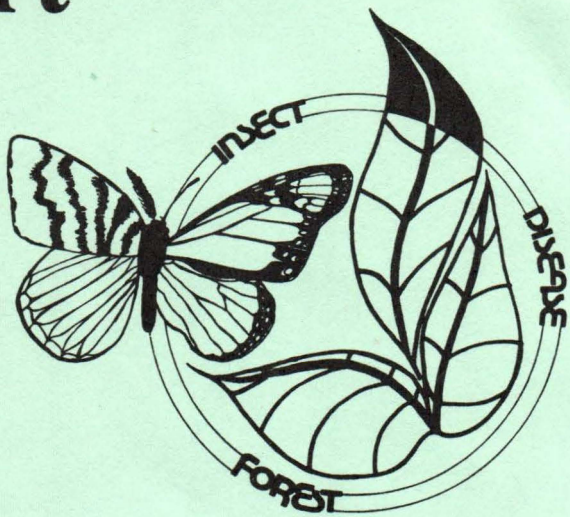
Missouri Forest Pest Report 1989



Missouri Department of CONSERVATION

Forestry Division

Missouri Forest Pest Report

Missouri Department of Conservation, Forestry Division, Box 180, Jefferson City, Missouri 65102

compiled by:

Ramon D. Gass, Forest Entomologist

Christopher J. Luley, Ph.D., Forest Pathologist

Table of Contents

Introduction 1
Conditions In Brief - Forest Insects 2
Forest Disease 2
The Program 3
Projects 4
Administrative Studies 4
Forest and Shade Tree Insects 5
Hardwood Defoliators 5
Hardwood Borers 12
Pine and Cedar Trunk Borer, Twig Borers and Defoliators . . 13
Forest and Shade Tree Diseases 19
Conifer Diseases 19
Hardwood Diseases 20
Conclusions 24
Insect and Host List by County 25
Disease and Host List by County 27
Results Administrative Studies 34
Pine Wilt Disease Survey 34
Evaluation of Nitrogen and Fungicides for Control of Foliar Disease of Black Walnut 35
Dogwood Anthracnose Survey 37

Plates I

Map—Eastern Tent Caterpillar 6
Map—Fall Webworm 7
Map—Gypsy Moth 8
Map—Loopers 9
Map—Willow Leaf Beetle 10
Map—Oak Slug Sawfly, Yellow-Necked Caterpillar 11
Map—Hardwood Borers, Bronze Birch Borer, Two-Lined Chestnut Borer, Tree Grasshopper 12
Map--Black Turpentine Beetle, Ips Beetle, Nantucket Pine Tip Moth, Pine Webworm 14
Map—European Pine Sawfly, Loblolly Pine Sawfly, Redheaded Pine Sawfly 15
Map—Obscure Scale, Pine Needle Scale, Tortise Scale, Kermes Scale 16
Map—Pine Spittle Bug 17
Map--Spider Mites, Pales Weevil, Gall Insects 18

Plates II

Map—Ash Yellows 20
Maps—Palmer Drought Index 22
Maps—Oak Wilt 23
Table 1—Pine Wilt Disease Survey 33
Table 1—Average infection ratings made on fungicide treatments for control of anthracnose and Mycosphaerella leaf spot on eastern black walnut seedlings. 35
Table 2—Average defoliation ratings on fungicide treatments used to control anthracnose and Mycosphaerella leaf spot on eastern black walnut seedlings. 37

Introduction

After the drought of 1988, there was considerable apprehension about the 1989 growing season. Overall, most trees rebounded well from last year's dry weather and our forest and shade trees have remained in good health.

Winter weather brought little relief precipitation wise with areas north of the Missouri river experiencing below average precipitation, although above average precipitation fell south of the river. A warm spell in January was followed by a rapid drop in temperatures and a colder than normal February. The precipitous drop in temperatures caused damage to ornamental species, particularly Bradford pear and procumbens junipers.

Spring weather continued dry with well below normal rainfall in both April and May. Frost damage occurred in scattered pockets in the Ozarks, but was generally not severe. The dry spring weather held back many disease problems. Sycamore anthracnose, however, caused moderate damage for the second consecutive year. Eastern tent caterpillar was also heavy on Prunus, and European pine sawfly was at high levels on Scotch and mugo pines.

The clouds opened and brought ample rains to most regions of the state the remainder of the growing season. Many potential negative effects of the 1988 drought were masked by the precipitation. Oak decline, for example, did not increase significantly in 1989, although this is still our most important forest pest problem.

For the most part, insect and disease conditions were stable for 1989. A survey for dogwood anthracnose failed to identify the disease in the state, pine wilt disease mitigated, and most insect problems were at endemic levels. Premature defoliation of black walnut due to a number of pest problems, and defoliation by fall webworm on pecan, hickory and walnut were highlights of the end of the season and brought it to a close.

Although most pest problems appeared stable in 1989, we have continued to closely monitor a number of insect and diseases. Male gypsy moths were trapped in scattered locations, a heavy infection of western gall rust was found on Scotch pine, and a new location with ash yellows was identified in 1989. A survey of black walnut plantations also found the Fusarium canker is common and widely distributed in the state. These as well as the endemic pests that continually impact our forest and shade tree resource were monitored and will be covered in this report.

Requests for assistance in pest diagnosis have continued to increase and Department foresters handled a large number of pest related calls in 1989. Pest management also conducted seven pest management seminars in which over 530 foresters, tree care and other individuals in the green industry were trained. This year also

brought a significant increase in new tree care video tapes in our video library, and writing of a "Manual on Common Insect and Tree Diseases in Missouri."

Conditions in Brief

Forest Insects

European Pine Sawfly - occurred in moderate to heavy numbers on Scotch and mugo pines this spring in scattered locations in north, east-central and west-central Missouri.

Fall Webworm - occurred in moderate to heavy populations on walnut trees and other hardwood species in south Missouri in 1989.

Eastern Tent Caterpillar - populations were heavy in south Missouri on eastern black cherry.

Aphid - populations were extremely heavy in south Missouri on miscellaneous hardwoods in late summer.

Walnut Caterpillar (Datana) - was especially abundant this year on walnut, hickory and pecan statewide.

Looper Complex - was heavy in localized areas in spring of 1989.

Forest Diseases

Ash Yellows - caused by mycoplasma-like organisms was found in one additional new county (St. Charles). Observation of stands found infected last year indicated decline symptoms increased significantly.

Botryosphaeria Canker - of Rocky Mountain juniper was identified in Jackson County at a new location. This is still the only county the disease has been found.

Diplodia Tip Blight - dry April weather for the second year in a row has resulted in greatly reduced new shoot tip infections on Austrian and other pines.

Dogwood Anthracnose - was not identified, although symptoms similar to the disease were apparent on many trees.

Drought Damage - was restricted mainly to northern counties. Oak mortality this spring in these counties was due to severe drought of last year.

Dutch Elm Disease - continued to affect many elms growing in hedgerows and bottoms, and urban areas.

Fire Blight - infection was severe again this year on a wide range of rosacious species.

Frost Damage - was evident on a variety of hardwoods in pockets in the Ozarks. Damage was light to moderate.

Fusarium Canker of black walnut - symptoms of the disease were found in most walnut plantations surveyed.

Hypoxylon Canker - was common on drought stressed oaks statewide on both urban and forest trees.

Lophodermium Needlecast - was at low levels again in 1989 and caused insignificant damage in Christmas tree plantations.

Oak Decline - stabilized this year due to ample rains during the growing season in 1989. A pocket was found in northern Dent County where both white and red oak groups were dying.

Oak Wilt - increased in 1989, particularly in forested areas.

Pine Wilt Disease - leveled off, probably due to adequate moisture during the growing season.

Sycamore Anthracnose - caused significant bud, shoot and twig blight for the second straight year. Branch dieback in upper crowns is common on many trees due to anthracnose infection and last year's drought.

Western Gall Rust - a Christmas tree plantation in Newton County was found to be infected with the disease.

The Program

In 1962, a cooperative program, the Forest Pest Control Program, was entered into with the U.S. Forest Service by the Forestry Division, Missouri Department of Conservation. Under the original agreement the effort is designed to detect, evaluate and control forest insects and diseases on state and private land. Department foresters and other personnel report occurrences of damaging insects and diseases. A forest entomologist and forest pathologist coordinate the program.

Insects, diseases, drought and other predisposing factors can cause damage to trees and shrubs which may be unnoticed until mortality occurs. Tree losses occur on an annual basis in the forest from hardwood borers and defoliators, pine cambial feeders, root rot, canker and stem diseases, drought and overmaturity.

Trees under stress were vulnerable to attack by insect borers, and a host of canker fungi and root rot fungi. Some factors which stress trees are drought, compacted soil, root disturbance, lightning strikes, insufficient soil elements, and wet or dry soil conditions to list just a few. Maintaining tree vigor is the most important consideration to ensuring a long life.

Projects

The cooperative team effort of Department foresters and Forestry Division staff specialists resulted in a well coordinated, successful Forest Pest Management Program in 1989. Over 3,500 shade and forest tree requests were serviced statewide in 1989. The services of staff specialists were available to foresters and others. In February and May, seven Pest Management training sessions were held in St. Louis, Kansas City, Cape Girardeau, Eminence, Springfield and Kirksville for foresters and personnel associated with the green industry. Over 530 people attended these seven meetings.

Department foresters and staff specialists serviced over 3,000 pest related telephone calls. Over 1,500 diagnoses of tree problems were made for the state. Forest pest management specialists and district foresters presented technical sessions to arborists at regional technical seminars and conferences.

Gass and Luley conducted detection and evaluation surveys on major insect and disease problems in 1989 on 5,000,000 acres. Reports were prepared and submitted to the U.S. Forest Service.

Plant Clinics were conducted in the St. Louis and Kansas City areas to serve the public in assisting them with their tree and shrub questions. A total of six Forest Insect and Disease Status Reports (April through September) were prepared and sent to all Missouri Christmas Tree Producers, most Department personnel, and other individuals involved in tree care, totaling 1,300 copies per month. Gass and Luley attended the annual State Cooperators Meeting hosted by the U.S. Forest Service in St. Paul, Minnesota in March. Luley attended the 1989 American Phytopathological Society Conference in Richmond, Virginia in August.

We completed our eighth season with the Integrated Pest Management Program (IPM) with the University of Missouri-Columbia. This multi-state reporting program has been developed to collect and computerize pest occurrence data for most economic plant pests in the state. Forestry Division is reporting results to the IPM Program for incidence of insects and disease on forest and ornamental trees.

Administrative Studies

Luley established a foliar disease control study on black walnut seedlings at the George O. White Nursery. Nitrogen and the fungicides Benlate and Nova (Rohm and Haas) were evaluated for control of foliar disease on 1-0 seedlings. Petroleum coated microscope slides were exposed in a walnut plantation near the nursery beds to evaluate spore release of the foliar disease pathogens.

In a related study, seedlings from a similar study last year were outplanted at Ashland Wildlife Area to evaluate the effect of controlling foliar disease in the nursery on survival and growth in a plantation.

A survey for Fusarium canker was conducted in 5-20 year old black walnut plantations. Site characteristics, cultural practices, and incidence and location of cankers on trees were determined in 42 plantations surveyed. Isolations from cankers collected in the plantations were made to determine the species of Fusarium present. The survey was made in cooperation with the U.S. Forest Service State and Private Forestry, St. Paul.

Luley surveyed Scotch pine plantations and windbreaks for pine wilt disease. The incidence of healthy, dead and pine wilt infected pines was determined.

A survey of flowering dogwood for dogwood anthracnose was made with M.E. Mielke of USFS, State and Private Forestry. Two tiers of counties from St. Louis south to the Bootheel were surveyed in July.

A number of cooperative projects with the University of Missouri-Columbia were funded by the Department and involved pest management. Two continuing projects with Dr. Marc Linit have been studying transmission of the pinewood nematode to Scotch pine by the insect vector Monochamus carolinensis, and black walnut nut loss caused by the walnut curculio. A third group of projects is focused on oak decline in the Ozark region. The projects cover survey and detection, management and etiology of oak decline and are contracted through a number of University researchers in the Forestry Department.

Forest and Shade Tree Insects

Hardwood Defoliators

Aphids - populations were heavy on hardwood foliage statewide in late summer. Molding honeydew was evident on leaf surfaces causing concern by citizens. Infestation was noticeable on walnut with many leaves dropping prematurely.

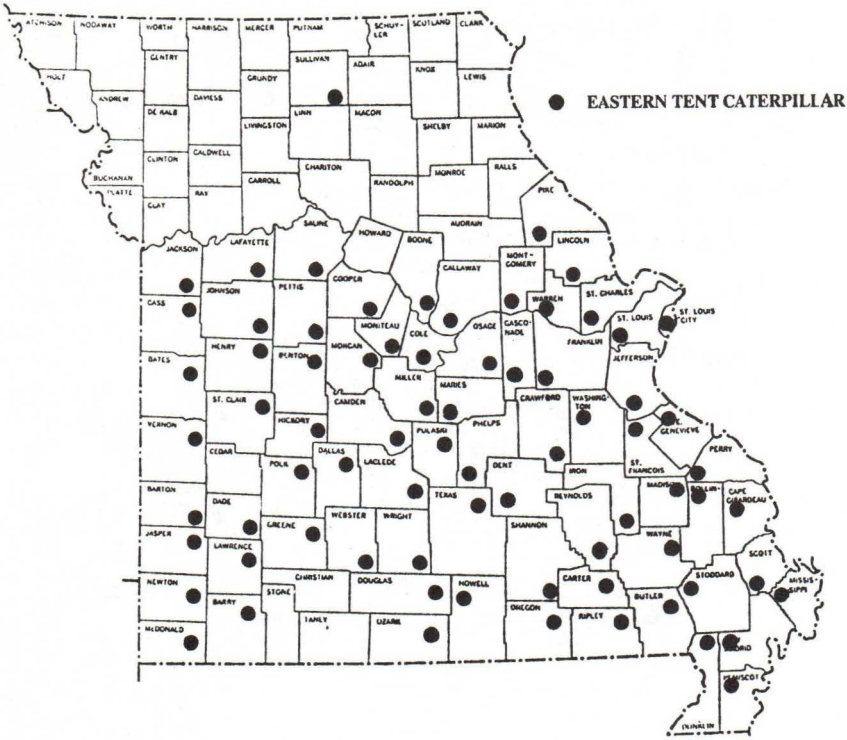
Trend - populations should collapse during 1990.

Suppression - Individual owners had their trees sprayed by arborists.

Eastern Tent Caterpillar - populations were heavy this spring where black cherry grows. Defoliation was complete on many trees with eight to ten webs per tree.

Trend - populations should be moderate to heavy in 1990.

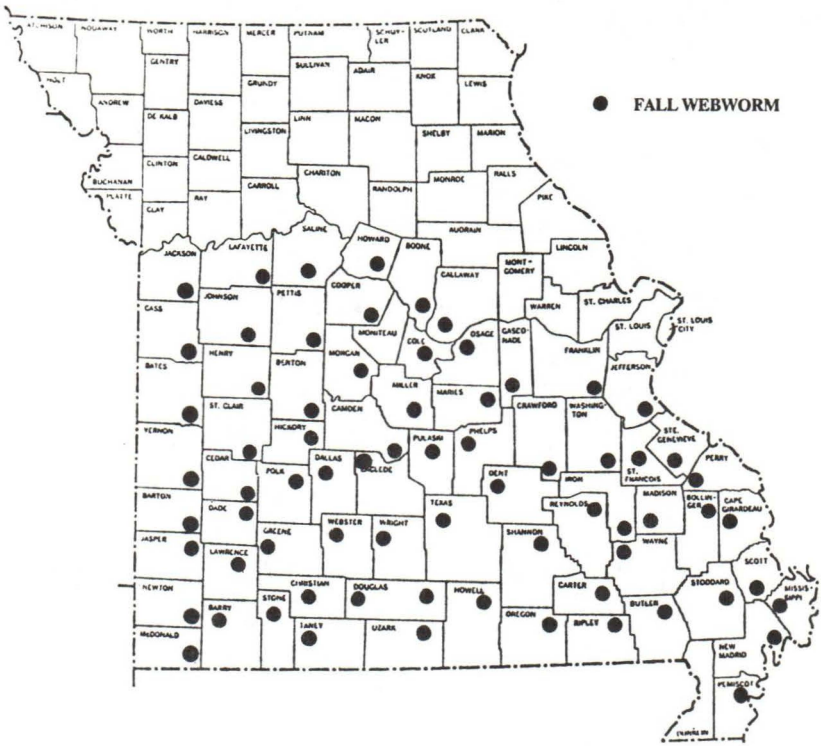
Suppression - no control was carried out in 1989.



Fall Webworm - populations were moderate to high in south Missouri. Webbing of black walnut, pecan, hickory, persimmon and redbud was common.

Trend - populations should be moderate to heavy in 1990.

Suppression - various walnut and pecan growers sprayed their trees to control this insect.



Gall Insects - generated numerous reports statewide in 1989. Gall insects such as flies, wasps, psyllid gall insects and mites are active in spring. These insects lay their eggs in succulent leaf or twig tissue where the swollen parts eventually develop. Galls commonly observed are on hackberry, hickory, pin oak, bur oak, hard maple and silver maple. Elm and walnut leaves also have galls in early summer. Woody stem galls are common on pin and shingle oak.

Trend - insect gall infestation is a part of nature. We will always have gall insect development with cyclical fluctuations. Galls will always be difficult to control.

Suppression - no control was conducted for gall insects in 1989.

True Tree Grasshopper - caused light defoliation in Wayne County. Its preferred hosts are white oak, red oak, hickory and flowering dogwood. Feeding produces a lacy appearance to the foliage. It is an insect of the forest and no control was feasible.

Trend - populations in 1990 should be larger causing moderate defoliation.

Walnut Caterpillar - populations were moderate to heavy over the state on black walnut, pecan and hickory. Leaf feeding begins in July and ends in late September. Other *Datana* species feed on red oak, post oak, sumac and huckleberry.

Trend - populations will be moderate in 1990 in most areas of the state.

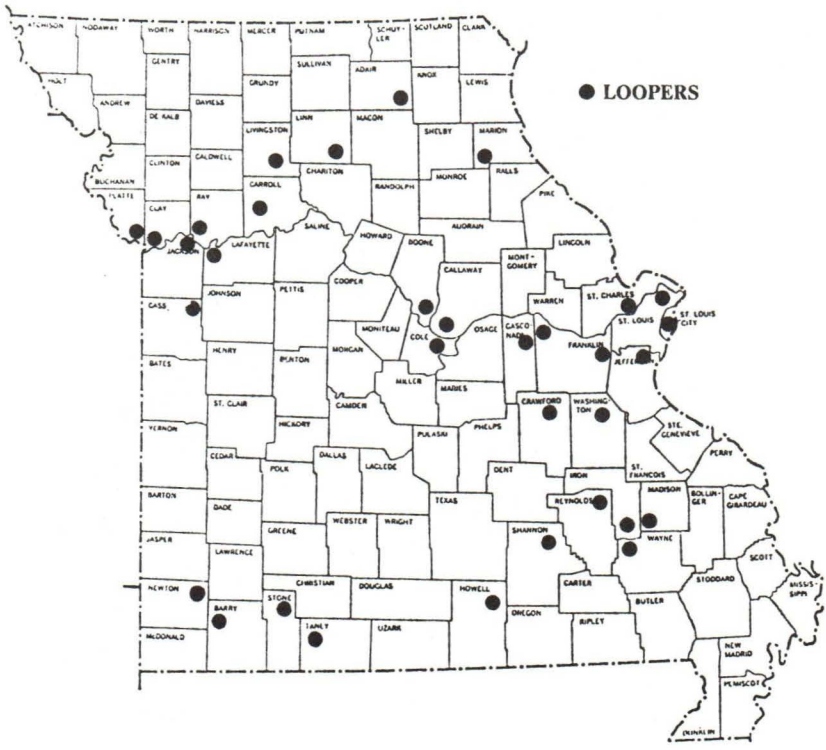
Suppression - a number of nut growers sprayed their trees for this insect with an approved insecticide.

Gypsy Moth - during the summer of 1989, the gypsy moth defoliated millions of acres of forest land in the northeastern United States. Spot infestations still remain in several states while the infested range continued to grow in central Michigan.

Personnel of the Missouri Department of Agriculture trapped eight male moths in St. Louis, two in Webster County and one in Callaway County. To date, no spot infestations have been discovered in Missouri.

In 1989, 7,516 gypsy moth pheromone traps were placed in 86 counties by U.S.D.A., A.P.H.I.S., P.P.Q. and personnel of the Missouri Department of Agriculture Plant Industry Division. Other cooperating groups or individuals were the Department of Natural Resources, State Parks and Historic Preservation, National Campers and Hikers Association, Corps of Engineers and John Grinstead at Ft. Leonard Wood.

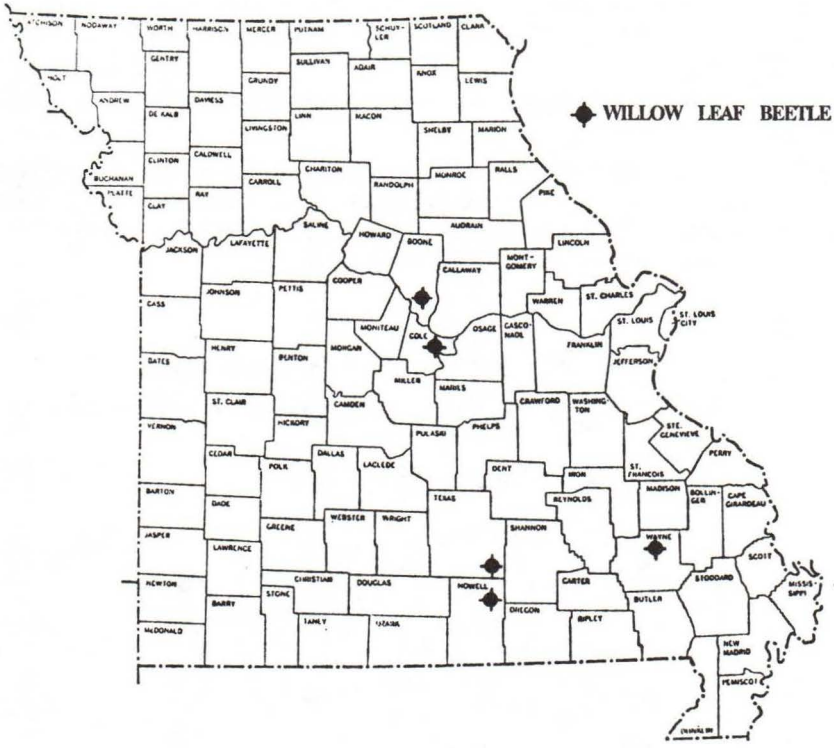
The gypsy moth isn't native to the United States, however its life cycle does parallel that of a number of other native insects. Gypsy moth larvae feed in spring and early summer on a variety of hardwood foliage. With three repeated defoliations of hardwoods, tree mortality can occur. One defoliation can kill evergreen trees such as pine or cedar.



Looper Complex - although defoliation was moderate to heavy, this group of insects was represented in many counties in 1989. The term, looper complex, is used to describe at least five different insects which emerge and feed on a variety of hardwood foliage at the same time of the year. Common loopers are the linden looper, elm spanworm, spring cankerworm, leaf roller and leaf tier. It may take two to three years for looper complex to build to a high level. Predators and parasites usually are responsible for the collapse of large populations of the looper complex.

Trend - 1990 population levels should be moderate in most sections of the state.

Suppression - no suppression work was done in 1989.



Scale Insects - as a group infest a variety of hardwood trees throughout the state. These are more common on ornamental hardwood trees such as pin oak, Euonymus, and white and post oak. Some of the scales which were reported during 1989 were the obscure scale on pin oak, Euonymus scale on Euonymus and Kermes scale on white and post oak. The most devastating scale is the obscure scale which infests pin oak, weakening it and causing decline and mortality.

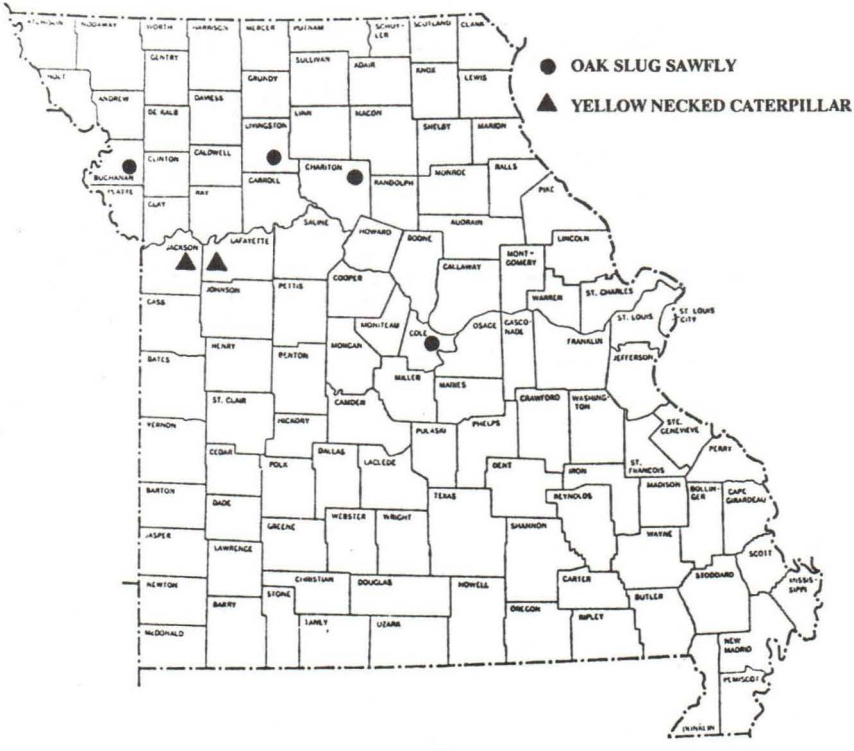
Trend - scales will continue to increase and cause decline on stressed hardwood trees. Scale populations will fluctuate on some trees species depending upon its life cycle.

Suppression - arborists use dormant oil, and an approved insecticide to control the crawler stage of the scale in spring.

Willow Leaf Beetle - infested black willow natural and planted trees causing light damage in five counties. Both the larvae and adult are gregarious feeders causing rapid defoliation.

Trend - populations will be light to moderate in 1990 unless parasites or predators intercede.

Suppression - defoliation was noted and reported by fisheries biologists who are doing riparian establishment, work using willow posts. Recommendations were made in 1989 to use Safer's Insecticidal Soap to control the leaf beetle in view of the sensitive issue of using any chemical insecticide.



Oak Slug Sawfly - populations were reported from four counties in 1989. The larvae of this insect skeletonizes black and red oak leaves, including pin oak. Defoliation was light to moderate in sapling sized trees as well as larger ornamental trees.

Trend - populations will be light to moderate in 1990.

Suppression - no control work was done.

Yellownecked Caterpillar - populations grew in 1989 in two counties. Heavy defoliation occurred on infested trees in Jackson and Lafayette Counties as reported by Urban Forester J. Monterastelli.

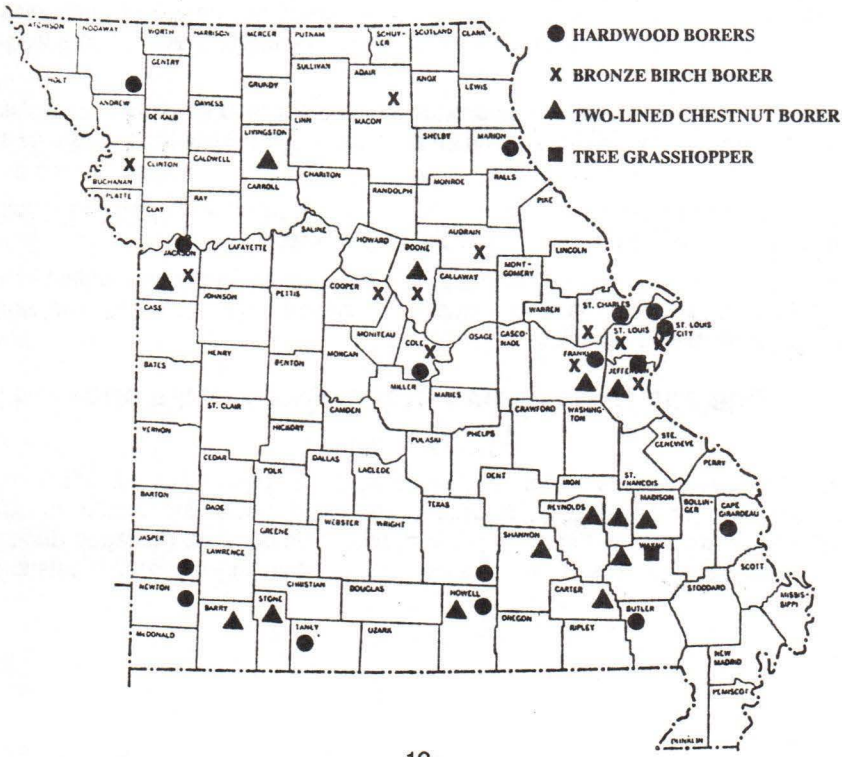
Trend - populations will increase in 1990.

Suppression - no control work was conducted in 1989.

Hardwood Borers

The Carpenterworm and Red Oak Borer - and other living tree hardwood borers as part of our endemic, indigenous borer populations continue to infest hardwood trees in our forested and urban areas of the state. Hardwood borers are a major problem on many newly planted and smaller caliper sized hardwood trees in urban areas.

Trend - borer infestation will continue in hardwood trees occupying poor sites. Estimate dollar loss to the hardwood borer complex amount to $3,000,000 annually through lumber degrade and ornamental tree loss.



Suppression - selective tree harvest, sanitation harvest and stand conversion from hardwood to pine were conducted in forested areas over the state. Some shade tree owners controlled borer infestations on high value trees.

The Cottonwood Twig Borer, Cottonwood Borer, Cottonwood Leaf Beetle and Poplar Tent Maker - continue to infest cottonwood where it grows. Borer damage is greater in trees growing on sites not suited to growing cottonwood. Defoliation by the Poplar Tent Maker occurs also everywhere cottonwood grows.

Trend - no increase in infestation is expected in 1990.

Two-Lined Chestnut Borer - is a secondary attacking insect of stressed oak trees. It plays a role in killing trees along with various root rots. In 1980, 1983, 1984 and 1988 drought conditions prevailed from late June through September over most of the state. As a result of the affects of drought, many more oak trees were lost. Other stressing factors are late frosts, poor sites and spring defoliators.

Trend - drought periods alternate in cycles of ten to fifteen years. Trees presently dying were stressed in earlier years and are just now affected. No new mortality is occurring as a result of recent weather conditions. Trees are continually dying in the forest as part of the natural succession of a maturing forest. Drought when present, along with other factors will always play a role in tree mortality.

Suppression - drought hazard sites must be identified by the forester and managed in such a manner as to consider species composition. Where hardwood basal area is too low, alternatives such as even-aged management or pine conversion should be considered within the shortleaf pine range. On droughty, poorer hardwood sites the entomological and pathological rotation should be applied rather than a fixed rotation age.

Bronze Birch Borer - populations continue to infest stressed white birch over the state causing extensive mortality. The insect is attracted to white birch wherever it grows.

Trend - stressed white birch will continue to die as a result of the stress factor which is usually drought and from the bronze birch borer infestation.

Suppression - a number of owners spray or have arborists spray their white birch trees. An effort is being made to acquaint nurserymen and landowners with our native river birch as a substitute for white birch.

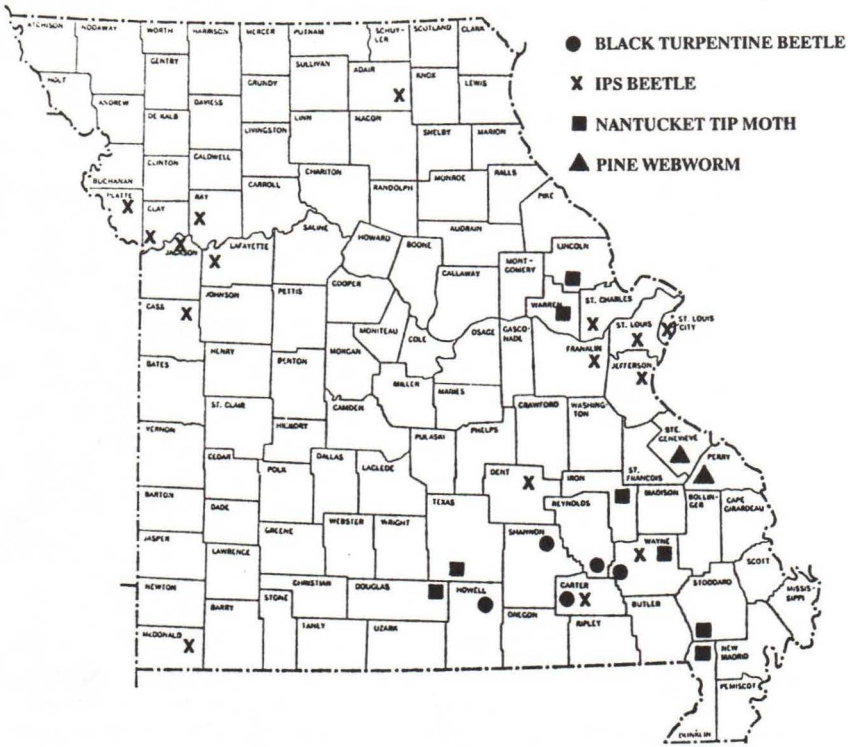
Pine and Cedar Trunk Borer, Twig Borers and Defoliators

Black Turpentine Beetle - light infestations were reported in Howell, Shannon, Reynolds, Carter and Wayne Counties. The black turpentine beetle infests weakened shortleaf pine trees those damaged in a timber sale, damaged during building construction, wind thrown or those struck by lightning. Once the infestation

has proceeded and is successful, the Ips beetle can also develop and complete the process of killing the tree.

Trend - beetle populations will develop where shortleaf pine trees are disturbed either naturally or artificially.

Suppression - where feasible, attacked trees are removed as timber cutting progresses in timber sale areas.

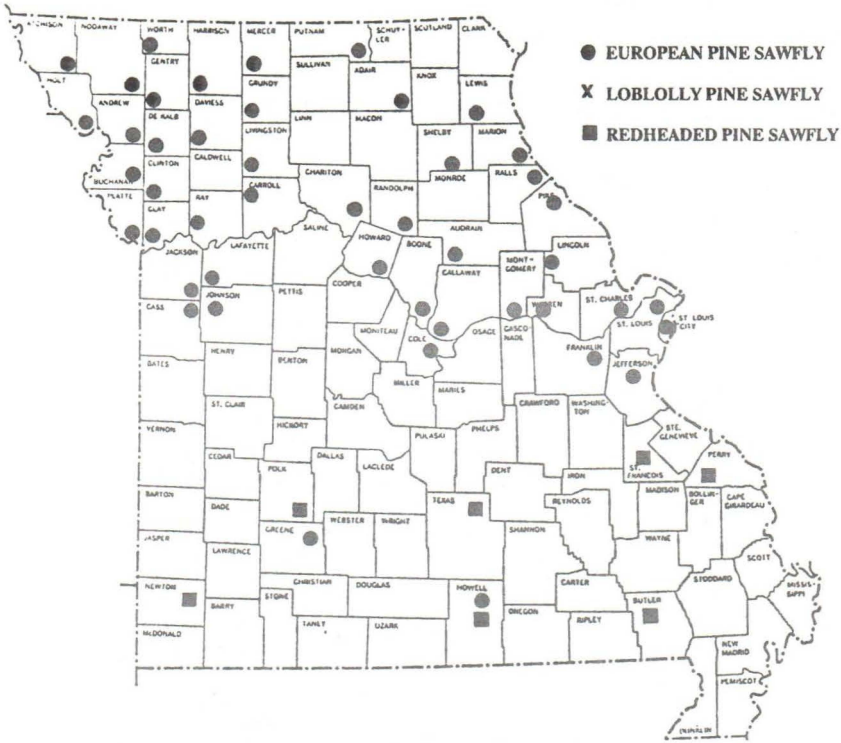


Ips Beetle - is a weak attacker of live, healthy shortleaf pine trees. It will also attack Scotch, jack, Virginia and Austrian pines. It is most usually detected on very stressed pines and pines that have infestations of black turpentine beetle. If new pine slash is created Ips often infests this slash and might later infest live, healthy neighboring pine trees. Ips was reported from fifteen counties although, very likely, pines in additional counties were infested. Ips has been infesting white and Scotch pines in the St. Louis and Kansas City areas.

Evergreen Bagworm - infestations of bagworms were light to moderate on upright pfitzer junipers and cedar over the state. Frequent defoliation of infested plants can lead to death over a two-to-three-year period.

Trend - bagworms will continue to threaten unsprayed ornamental evergreens. Populations are expected to be light to moderate statewide in 1990.

Suppression - some owners of evergreens had their shrubs sprayed by tree service companies.



European Pine Sawfly - populations were moderate to heavy on Scotch and mugo pine planting primarily in north Missouri. Reports were submitted for 45 counties where heavy defoliation was observed. Affected trees are grown for Christmas trees and ornamental purposes. The larvae are spring and early summer defoliators.

Trend - populations will be moderate to heavy in 1990.

Suppression - a number of Christmas tree producers and homeowners sprayed their plants where this insect was a threat.

Loblolly Pine Sawfly - was not reported in 1989. It is a late spring defoliator of shortleaf pine.

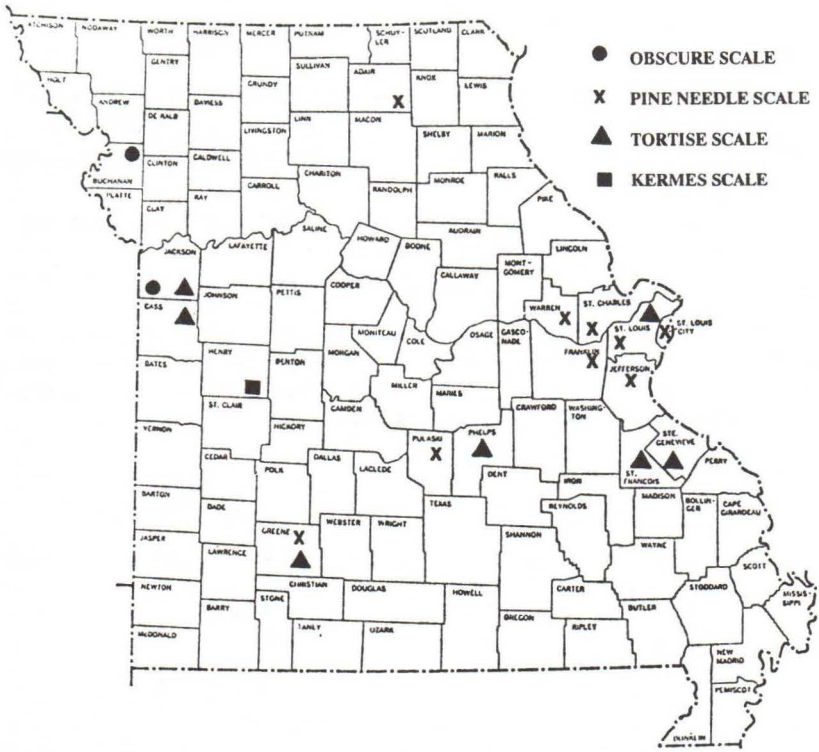
Redheaded Pine Sawfly - populations were light to moderate in 1989 being reported in six counties. Redheaded pine sawfly larvae feed on shortleaf and Scotch pines primarily in the sapling stage.

Trend - populations will be light to moderate in 1990.

Pales Weevil - populations were low in 1989. No infestations were reported. Pales weevil adults feed on terminal and lateral twigs at night causing flagging of the infested trees. Scotch pine is most affected however white pine can also be fed upon.

Trend - populations should be light in 1990.

Suppression - no suppression was required this year. Our standard control recommendation is to spray stumps produced during the previous Christmas season with thiodan and diesel fuel in March of the following year. Unless growers already have the problem, they usually do not take control measures to prevent possible weevil build-ups for the following year.



Pine Needle Scale - populations were light to moderate in scattered areas around the state and specifically in Jackson and Warren Counties and in the greater St. Louis area in 1989. The scale occurs on needles of Scotch and mugo pines. Scales can build on needles in such large numbers that the plant appears to be whitewashed.

Small infestations should be controlled before the populations grow too large and difficult to control. There is always a potential for spread to surrounding Scotch pine trees. Although the pine needle scale is difficult to control, superior dormant oil can be used anytime of the year and Sevin or Dursban can be used to control the crawler stage synchronized with the blooming of lilac in spring.

Trend - populations will continue to build, unless some natural biological control factor intervenes, infestations will increase in 1990.

Suppression - several Christmas tree growers sprayed individuals and groups of trees to control the pine needle scale in 1989.

Pine Webworm - populations were low in 1989. The pine webworm adult is a moth. The larvae feed on needles of shortleaf and Scotch pines creating a packed mud-like cluster on the top of the main stem. Defoliation occurs mostly on smaller pine trees which retards growth and causes an unsightly tree. Infestations occurred in Ste. Genevieve and Perry Counties in 1989.

Trend - populations will be light to moderate on scattered trees in 1990.

Suppression - certain Christmas tree growers will spray their trees with an approved insecticide.

Pine Tortise Scale - infested Scotch pine Christmas trees in plantations in seven counties in 1989. This insect does not normally become epidemic in a planting because of natural predation by lady beetles and predaceous bugs. Only large trees are usually affected in scattered plantations.

An infestation can be detected by the honeydew which has molded, imparting a gray or black cast to the infested portion of the tree.

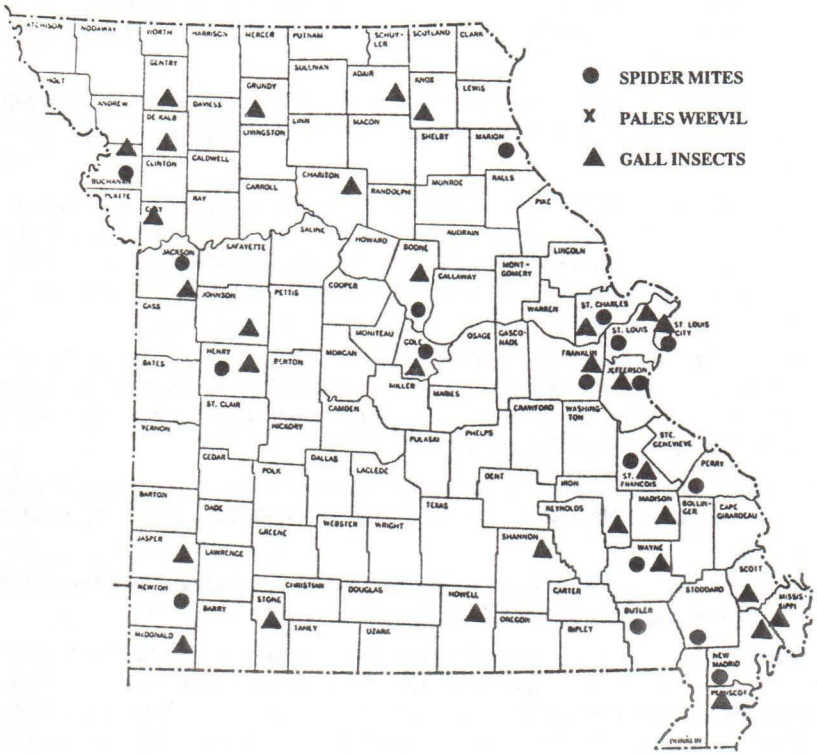
Trend - populations should be light to moderate in 1990.

Suppression - Christmas tree growers were advised to spray dormant oil on only those trees infested prior to winter. If required, growers will spray their infested trees in late May of 1990 with Sevin or Dursban to control the crawler stage of the scale.

Spider Mites - are normally a nuisance on various tree species in summer. Infestation was light to moderate over the state in 1989. Reports of occurrence were received in scattered counties around the state. Spider mites can be especially damaging to Scotch pine, baldcypress, Norway spruce, white pine, and Colorado and white spruce. Spider mites were not as serious as in 1988. However, conditions were good for development of spider mite populations. Feeding by spider mites produces a light-green, mottled color to infested needles. Upon closer examination, eggs, egg cases, webbing of adults can be observed on infested plant material.

Trend - if the summer of 1990 is not as dry, spider mite populations will be high. Although feeding seldom directly kills trees, it does stress them and damages the aesthetic value of Christmas trees and ornamental plants.

Suppression - arborists use miticides to control the various species of spider mites. Christmas tree growers spray their Scotch pine trees for spider mites as the problem develops.



Forest and Shade Tree Diseases

(Conifer Diseases)

Western Gall Rust - was not identified in any new counties in 1989. A Scotch pine Christmas tree plantation near Diamond in Newton County, which was suspected to be infected last year, was confirmed this year as having the rust based on multiple galls on single branches. A survey of this plantation found 9% of the Scotch pine infected in the 37 acre plantation. Re-survey of an infected Boone County plantation found a single tree infected. The affected branch was removed. Two other known locations of the disease are ponderosa pine plantations on University of Missouri experimental farms in Boone and Lawrence Counties.

Trend - no significant increase in the disease is expected. Other Scotch pine plantations in southwest counties may be infected, but have not been found.

Suppression - infected trees, or galls on infected trees where infection is low, have been removed in the Boone County pine plantation.

Lophodermium Needlecast - caused minor damage on Scotch pine in Christmas tree plantations in 1989. Dry fall weather in the late summer-early fall of 1988 held the disease in check.

Trend - August was wet in many areas however, September and October were abnormally dry. Low levels of Lophodermium needlecast are expected in the spring of 1990.

Suppression - Most Christmas tree growers did not spray for Lophodermium needlecast in the late summer and fall of 1988. Two to three applications of chlorothalonil from August to October are needed to control the disease. Damage caused by the needlecast has not occurred on an annual basis and therefore the disease has not warranted control.

Diplodia Tip Blight - new shoot tip infection on Austrian and other susceptible pines were at exceptionally low levels because of dry weather during bud expansion. Dieback has continued on older Austrian pines due to the tip blight because of previous years branch tip infection and cankers.

Trend - Diplodia infection is currently at reduced levels and no rapid increase in the disease is expected. New shoot tip infections are dependent on spring weather conditions.

Suppression - Applications of benomyl made at bud break and again 7-14 days later is the most commonly used control for Diplodia tip blight.

Pine Wilt Disease - was at reduced levels in 1989, apparently due to cooler, wetter conditions during the growing season. No infections were reported in Christmas tree plantations, as occurred last year. Scotch and Austrian pines in ornamental and windbreak plantings were the main species affected. Infection rates for 1988 are reported in the appendix for a number of windbreaks and plantations.

Trend - no significant increase in pine wilt disease is expected unless below normal precipitation or above normal temperatures prevail in 1990.

Suppression - removal and destruction of infected pines before the end of March is the only current management practice. This sanitation is aimed at reducing levels of Monochamus spp. which vector the pinewood nematode.

Brown Spot Needle Blight - continued to cause damage in Scotch pine Christmas tree plantations, although at lower levels in 1989. Dry spring weather held back the disease, which infects needles mainly during May and early-June. Ornamental Scotch pines are not seriously affected by the disease.

Trend - Brown spot has the potential to cause considerable damage in Christmas tree plantings. Infection levels are governed mainly by spring weather conditions.

Suppression - Most growers spray twice with chlorothalonil. Once when needles are 1/2 elongated and again when needles are fully expanded. Most growers have also discontinued planting of the shorter needled varieties of Scotch pine, which are very susceptible to brown spot.

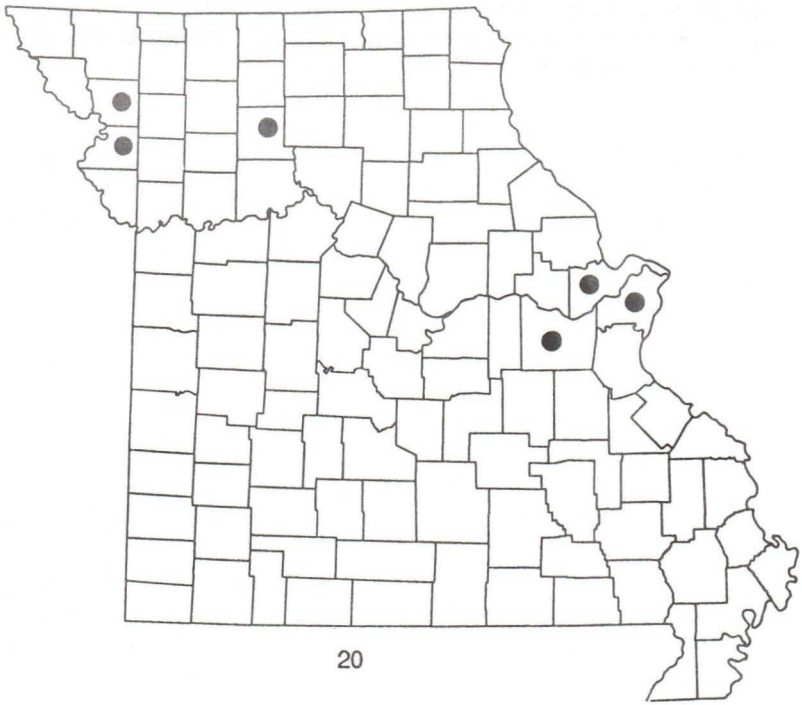
Hardwood Diseases

Ash Yellows - caused by mycoplasma-like organisms (MLOs) was found in a single new county, St. Charles, in 1989. Decline symptoms intensified on white ash, probably due to the combined impact of the disease and the drought.

Trend - no significant spread is expected, although it is likely additional locations of white ash with ash yellows will be found.

Suppression - No specific suppression efforts have been made.

Ash Yellows



Drought Damage - ample rains during the growing season alleviated most acute shortages of water. Evidence of direct drought injury was most apparent north of the Missouri river. Mortality of oaks in the spring of 1989 in some northeast counties was probably directly related to 1988 dry weather. Palmer Drought Severity Index (PDSI) values are given for May through September. PDSI reflects soil moisture levels in both upper and lower soil profits.

Trend - we have experienced an abnormally dry fall and are slowly going back to soil moisture deficits of the previous year. Winter injury could be a problem if the dry weather persists.

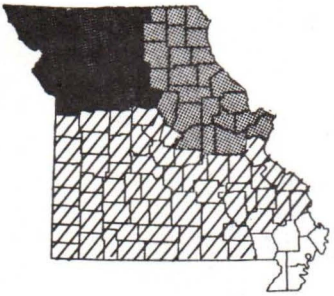
Suppression - none, although watering was recommended in the fall in ornamental situations.

Oak Decline - did not increase significantly in 1989, although the disease continued to affect a large number of oaks in the eastern Ozark Region. Scarlet, red and black oak were the most commonly affected, although decline and mortality of white and post oak were found in northern Dent County on Indian Trails State Forest. Scattered areas of oak decline were present in north Missouri. Rain during the growing season occurred frequently and in large enough amounts to slow the increase in oak decline. Trees that rapidly "scorched" or browned out, which is common in drought years, were evident at low levels. Secondary agents such as two-lined chestnut borer, Armillaria root rot and Hypoxylon canker were common on declining trees. In urban, areas, oak decline was present on a wider range of oak species and is usually associated with site or root disturbance, soil compaction or mechanical injury.

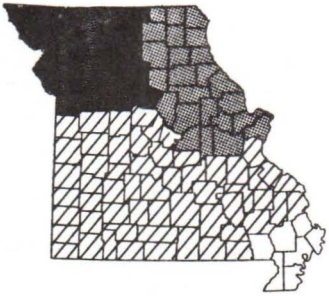
Trend - no dramatic increase in oak decline is expected unless abnormally dry weather develops in 1990.

Suppression - salvage cuts were made in areas with severe oak decline. Stands with moderate decline were left undisturbed because thinning or other activities tend to increase the decline.

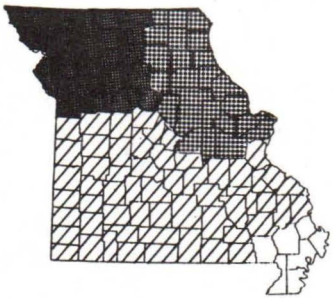
May 1989



June 1989



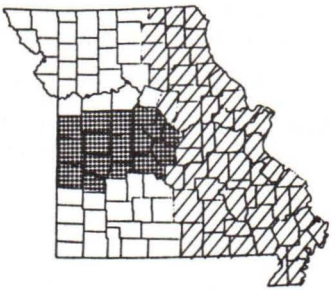
July 1989



August 1989

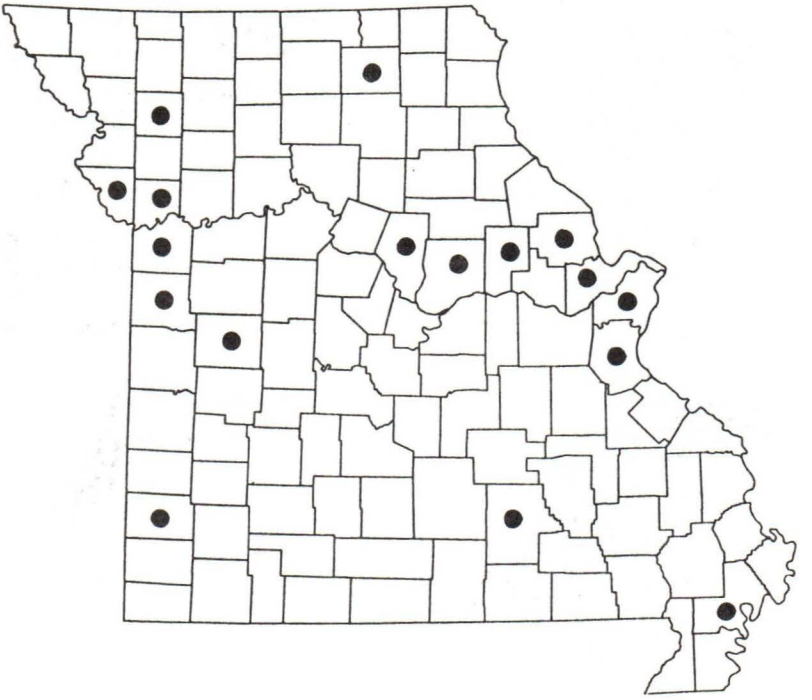
September 1989

October 1989



Extreme Drought
Severe Drought
Moderate Drought
Mild Drought
Near Normal or Moist

Oak Wilt



Oak Wilt - most damage from oak wilt is usually in urban areas on older shade trees. The wilt, however, was more evident in forest situations in 1990, although it was still at endemic levels and caused only minor loss in the oak resource.

Trend - oak wilt is expected to continue at endemic levels.

Suppression - severing root grafts, removing affected trees, and avoiding wounding oaks in the spring and early summer were recommended for oak wilt.

Sycamore Anthracnose - was moderate to severe on many American sycamores this year. Although weather conditions were dry in the early spring, cool weather during bud expansion was favorable for infection. Many trees failed to leaf out fully because of the canker and shoot blight phase of the disease. This is the second year of severe anthracnose and many trees are exhibiting dieback due to the disease.

Trend - severity of anthracnose is closely tied to spring weather conditions. Ample inoculum is present in tree crowns. Dieback will continue if anthracnose is severe again next year.

Suppression - fungicide applications during bud break and leaf expansion are generally inefective. Injection of Arbotect 20S in September can significantly reduce infection for up to three years.

Conclusions

Pest conditions were relatively stable in 1989 despite the significant drought stress from the previous year. We still may, however, see an increase in pest activity because of the dry conditions in 1988 and early 1989. Secondary borers and diseases have been noted to become most evident two year's post a drought episode.

Many pest problems go unrecognized until formal surveys, trapping studies or yearly monitoring are undertaken. We hope to increase our emphasis on surveys to detect pests, and to continue to monitor those pests with potential to cause significant damage to our forest resource. In particular, yearly monitoring of gypsy moth will continue to be given high priority in an attempt to identify infestations of the insect as they occur.

The 1980's have brought our most significant departures from normal weather patterns that have occurred this century. Current concern with the "greenhouse effect," and the importance of planting trees to offset its negative impacts, will mean a bigger emphasis on tree care and tree health. Pest management will be an integral part of the current and future emphasis on developing and maintaining healthy trees. We intend to focus on training of groups and individuals in pest management, particularly IPM, and believe this will be an important contribution to efforts to combat global warming.

We have been able to collect and assemble this statewide report on pest incidence because of information from our District reports. Although pest management is often not a primary focus of our District Personnel, their cooperation and teamwork has been a key to a successful Forest Pest Management Program.

Insect-Host	County
Bagworm *Thyridopteryx ephemeraeformis* (Haw.) on assorted evergreens and certain hardwoods	Statewide
Black Turpentine Beetle *Dendroctonus terebrans* (Oliv.)(Shortleaf pine)	Carter, Howell Reynolds,Shannon, Wayne
Borers, Hardwood Oaks	Butler
Carpenter worm, red oak borer, Goes sp.	Cape Girardeau Cole, Franklin Howell, Jackson Jasper, Jefferson Marion, Newton Nodaway, Taney Texas, St.Charles, St. Louis, St. Louis City
Bronze Birch Borer *Agrilus anxius* (Gory) (White Birch)	Statewide
Cottonwood Borer *Plectrodera scalator* (F.)	
Cottonwood Leaf Beetle *Chrysomela scripta* (F.)	
Cottonwood Twig Borer *Gypsonomia haimbachiana* (Kft.)	
Two-Lined Chestnut Borer *Agrilus bilineatus* (Web.)(Oaks)	Statewide
Twig Girdler *Oncideres cingulata* (Say) (Hickory and persimmon)	Cole, Iron Reynolds
Eastern Tent Caterpillar *Malacosoma americanum* (F.) on (Prunus sp.)	Statewide
Elm Leaf Beetle *Pyrrhatta luteola* (Mueller) (on elm)	Statewide
European Pine Sawfly *Neodiprion sertifer* (Geoff)(Scotch and mugo pines)	Adair, Andrew Atchison, Audrain, Boone, Buchanan,Callaway, Carroll, Cass, Chariton, Clay, Clinton, Cole, Daviess, DeKalb, Franklin, Greene, Grundy, Harrison,

	Holt, Howard, Howell, Jackson, Jefferson, Johnson, Lafayette, Lewis, Lincoln, Linn, Livingston, Marion, Mercer, Montgomery, Nodaway, Pike, Platte, Putnam, Ralls, Ray, Randolph, Shelby, St. Charles, St. Louis, St. Louis City, Warren, Worth
Fall Webworm *Hyphantria cunea* (Drury) (black walnut and other hardwood species)	Statewide
Gall Insects on assorted hardwoods	Statewide
Gypsy Moth (in traps)	Callaway, St. Louis, Webster
Ips pini (Say) (shortleaf and other pines)	Adair, Carter, Cass, Clay, Dent, Franklin, Jackson, Jefferson, Lafayette, McDonald, Platte, Ray, St. Charles, St. Louis, St. Louis City Wayne
Imperial Moth *Eacles imperilis* (Drury)	Dent
Looper Complex on Hardwoods	Statewide
Nantucket Pine Tip Moth *Rhyaiconia* frustrana (Comst.) on (shortleaf pine)	Douglas, Dunklin, Iron, Lincoln, Stoddard, Texas, Warren, Wayne
Obscure Scale *Melanaspis obscura* (Comst.) (pin oak)	Buchanan, Cole,

	Jackson, St. Louis
Pine Needle Scale *Phenacaspis pinifoliae* (Fitch) on (Scotch pine)	Franklin, Greene, Jackson, Jefferson, Pulaski, St. Charles, St. Louis, St. Louis City, Warren
Pine Tortise Scale *Toumeyella numismatica* (P. & McD.) on (Scotch pine)	Cass, Greene, Jackson, St. Louis, St. Francois, Ste. Genevieve
Pine Webworm *Tetralopha robustella* (Zeller) on (Scotch and shortleaf pines)	Perry Ste. Genevieve
Poplar Tent Maker *Ichthyura inclusa* (Haldeman)	
Redheaded Pine Sawfly *Neodiprion lecontei* (Fitch) on (shortleaf and Scotch pines)	Butler, Newton, Howell, Polk, Perry, St. Francois
Spider Mites *Oligonychus spp. and* Tetranychus *spp.*	Statewide
Spittlebug, Pine *Aphrophora parallela* (Say) on (Scotch pine)	Howell, Wayne
True Tree Grasshopper *Dendrotettix quercus* (Packard) on (hardwoods)	Wayne
Walnut Caterpillar *Datana integerrima* (G.&P.) on (walnut, pecan and hickory)	Statewide
Willow Leaf Beetle *Chrysomela interrupta* (F.) on (willow)	Boone, Cole, Howell, Texas
Yellownecked Caterpillar *Datana ministra* (Drury) on (pin oak)	Jackson, Lafayette

Disease and Host

Actinopelte Leaf Spot *Actinopelte dryina* (Sacc.) Hoehn. (Pin oak)	No reports

Air Pollution Flouride (Pawlounia, Oak)	New Madrid, Pemiscot
Air Pollution Ozone (White pine)	Boone, Buchanan, Clinton, Cole, Howell, Phelps, St. Louis, Taney
Annosus Root Rot *Heterobasidion annosum* (Fr.) Bref. (Shortleaf pine)	Wayne
Apple Scab *Venturia inaequalis* (Cke.) Wint. (Crabapple, apple)	Callaway, Cole, Wayne
Armillaria Root Rot *Armillaria mellea* (Vahl. ex. Fr.)Karst. (Black oak, Hickory, Post oak, White oak)	Dent, Lewis, Morgan, Phelps, Shannon, Stone, Taney
Ash Yellows Mycoplasmalike organisms (White Ash)	Andrew, Buchanan, Franklin, Livingston, St. Charles, St. Louis
Black Knot *Apiosporina morbosa* (Schw.) Arx (Black Cherry)	Howell, Texas
Bleeding Necrosis *Botryosphaeria ribis* Gross and Dug. (Sweetgum)	Marion
Botryosphaeria Canker *Botryosphaeria stevensii* Shoe. (Rocky Mountain Juniper)	Jackson
Brown Spot Needle Blight *Scirrhia acicola* (Dearn)Siggers (Scotch pine)	Boone, Callaway, Christian, Crawford, Franklin, Gasconade, Jefferson, McDonald, Newton, Shannon, Washington
Cedar Apple Rust, Cedar Quince Rust *Gymnosporangium spp.* (Hawthorne)	Statewide
Cercospora Blight *Cercospora sequoiae* var.	

juniperi Ell. & Ev. (Red Cedar)	Cole, Moniteau
Chlorine Damage (White pine)	Greene
Collar Rot *Phytophthora sp.* (Dogwood)	Jefferson, St. Charles, St. Louis
Cylindrosporium Leaf Spot *Cylindrosporium quercus* Sorok. (Red oak)	Jackson
Cyclaneusma Needlecast *Cyclaneusma* minus (Butin)Dicosmo, Peredot & Minter (Scotch pine)	Boone, Callaway, Howard, Johnson, Livingston
Cytospora canker *Cytospora kunzei* Sacc. (Blue spruce)	Boone, Callaway, Marion
Cytospora Canker *Cytospora sp.* (Bradford pear)	Boone, Callaway, Clay, Franklin, Jackson, Marion
Diplodia Tip Blight *Sphaeropsis sapinea* (Fr.) Syke & Sutton (Austrian pine, ponderosa pine, Scotch pine)	Boone, Callaway, Cole, Jackson, Jefferson, Phelps, St. Charles, St. Louis
Dothiorella Canker *Botryosphaeria quercum* (Sch.) Sacc. (Post oak)	Howell, St. Louis
Dothistroma Needle Blight *Dothistroma pini* Hol. (Austrian pine)	Howard, Jasper, Ozark
Drought Damage (Hardwood and Conifer species)	Adair, Buchanan, Cass, Clay, Jackson, Johnson, Newton, Platte, Warren
Dutch Elm Disease *Ceratocystis ulmi* (Boism.) Moreau (American Elm, Red Elm)	Boone, Carter, Cass, Clay, Greene, Henry, Howell, Jackson,

	Jasper, Jefferson, Lafayette, Lincoln, Livingston, McDonald, Montgomery, Perry, Pulaski, St. Charles, St. Louis, Taney, Warren, Wayne
Eastern Gall Rust *Cronartium quercum* (Berk.) Miyabe ex. Shirai f. sp. echinatae (Shortleaf pine)	Butler, Cape Girardeau, Howell, Texas Wayne
Elm Phloem Necrosis Mycoplasmal (American Elm)	Wayne
Fireblight *Erwinia amylovora* (Burr.) Winsl. (Apple, Cotoneaster, Crabapple, Mountain Ash)	Buchanan, Douglas, Franklin, Jackson, Phelps, St. Louis, Wayne
Frost Damage (Various Hardwood Species)	Boone, Buchanan, Carter, Cass, Clay, Greene, Howard, Iron, Jackson, Jefferson, Lafayette, Platte, Randolph, Reynolds, St. Charles, St. Francois, St. Louis, Stone, Taney, Wayne
Fusarium Canker *Fusarium solani* (Mart.) Appel. & Wallenw.Emend Synd. & Hans.	

(Black Walnut)	Howell
Hail (Scotch pine)	Jackson
Heat Scorch (Ash, Sugar Maple, Maple, Silver Maple)	Clay, Jackson, Livingston, Oregon
Hypoxylon Canker *Hypoxylon atropunctatum* (Schw. ex. Fr.) Cke. (Black oak, Bur oak, pin oak, red oak, Scarlet oak, Shingle oak, white oak)	Clay, Crawford, Dent, Franklin, Gasconade, Howell, Jackson, Jefferson, Johnson, Lewis, Shannon, St. Charles, St. Louis, Stone, Taney, Texas, Warren, Wayne Washington
Iron Chlorosis Mineral Deficiency (Sweetgum, Pin oak)	Boone, Jackson
Lophodermium Needlecast *Lophodermium seditiosum* Staley & Millar (Scotch pine)	Franklin, Greene
Maple Anthracnose Gloeosporium apocryptum Ell. & Ev. (Red Maple, Silver Maple, Sugar Maple)	Bollinger, Butler, Cape Girardeau, Greene, Perry, St. Francois
Maple Decline Complex of biotic & abiotic factors (Sugar Maple)	Boone, Cole, Franklin, Henry
Mycosphaerella Leaf Spot *Mycosphaerella juglandis* Kess. (Black Walnut)	Cole, Texas, Wayne
Oak Anthracnose Gnomonia quercina Kleb. (N. Red oak, Post oak)	Douglas, Stone, Taney
Oak Decline Complex of abiotic & biotic factors (Black oak, Pin oak, Red oak, Post oak, Scarlet oak, White oak)	Bollinger, Boone Camden,

	Cape Girardeau, Cole, Dent, Howell, Jefferson, Lewis, Linn, Livingston, Ozark, Pettis, Reynolds, Shannon, St. Charles, St. Louis, Taney, Wayne
Oak Wilt *Ceratocystis fagacearum* (Bretz)Hunt (Black oak, Bur oak, N. Red oak, Pin oak, Scarlet oak, Shingle oak, White oak)	Adair, Boone, Buchanan, Callaway, Cass, Clay, DeKalb, Henry, Jackson, Jasper, Jefferson, Lincoln, Livingston, Montgomery, Morgan, New Madrid, Platte, Shannon, St. Charles, St. Louis, Warren
Phyllosticta Leaf Spot *Mycosphaerella fraxinicola* (Schw.) House (Ash)	St. Francois
Pine Needle Rust *Coleosporium asterum* (Diet.) Syd. (Shortleaf Pine)	Buchanan, Crawford, Howell, Wayne
Pine Wilt Disease, *Bursaphalenchus xylophilus* Steiner & Burher (Austrian pine, Scotch pine)	Audrain, Bollinger, Boone, Callaway, Camden, Clay, Clinton, Cole, Cooper, Howard, Jackson, Jefferson, Linn, Livingston,

	Moniteau, Platte, Randolph, Saline, Shannon, St. Charles, St. Louis
Ploioderma Needlecast *Ploioderma lethale* (Dearn.) Darker (Shortleaf pine)	Wayne
Phomopsis Tip Blight *Phomopsis juniperovora* Hahn. (Red Cedar, junipers)	Bollinger, Cape Girardeau, Greene, Howell, Perry
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi* Bub. (Blue Spruce)	Adair, Boone, Cape Girardeau, Clinton, Cole, Greene, Jackson, Jasper, Phelps
Sapsucker Damage *Sphyrapicus varius* (Scotch pine, White pine)	Howell, Marion
Schizophyllum commune Fr. (Maple)	Boone
Septoria Leaf Spot *Septoria aceris* (Lib.) Berk. & Br. (Norway Maple)	Boone, Cole, Franklin
Slime Flux *Erwina spp.* (American Elm, Siberian Elm, Mulberry)	Boone, Callaway, Clinton, Cole, Cooper, Polk
Sycamore anthracnose *Gnomonia plantani* Heb. (Sycamore)	Butler, Camden, Crawford, Douglas, Dunklin, Franklin, Gasconade, Howell, Jefferson, Marion, Mississippi, New Madrid, Newton, Pemiscot, Perry, Ralls, Ripley, Scott,

	St. Charles, St. Francois, St. Louis, Stoddard, Washington, Wayne
Tar Spot *Rhytisma acerinum* Pers. ex. Fr. (Soft Maple)	Wayne
Valsa Canker *Valsa sordida* Nits. (Weeping Willow)	Henry
Verticillium Wilt *Verticillium dahliae* Leb. (Catalpa, Maple)	Boone, Callaway, Clay, Greene, Jackson, Jefferson,Platte, Shannon, St. Charles, St. Louis, Wayne
Walnut Anthracnose *Gnomonia leptostyla* (Fr.) Ces. & Den. (Black Walnut)	Boone, Cole, Perry, Schuyler, St.Francois,Texas
Western Gall Rust *Endocronartium harknessii* (Moore) Y. Hiratsuka (Scotch pine)	Boone, Newton
Winter Burn and Drying (Bradford pear, Holly, Jap. Black Pine, Scotch pine, Yellow Poplar)	Callaway, Clay, Greene, Jackson, Jasper

Results Administrative Studies

Pine Wilt Disease Survey

A survey of older (15 year and greater) Scotch pine plantations and windbreaks was made in 1988, and the same plantations were resurveyed in 1989. The plantings were surveyed in March and April to determine yearly increase of the disease in Scotch pine. Trees were scored as healthy, infected by pine wilt in 1988 and showing symptoms but not yet dead (Infected 1988) killed by pine wilt infection in 1988 (Dead 1988), killed by pine wilt in 1987 (Dead 1987) or dead from previous years (Dead). Results, are presented in Table 1.

The plantations and windbreaks will be resurveyed again next year.

TABLE 1 - Pine wilt disease in Scotch pine plantations and windbreaks. Table headings are discussed in text.

Planting	%Healthy	%Dead 1987	%Infected 1988	%Dead 1988	%Dead Trees	Total
South						
Short Plantation	76.6	9.4	0.4	2.8	10.7	497
Cole County						
24 year old abandon						
Christmas Tree Plantation						
North						
Short Plantation	77.1	8.2	0.3	3.2	11.2	616
Cole County						
24 year old abandon						
Christmas Tree plantation						
C-Highway						
Windbreak	85.5	8.1	1.3	4.4	0.6	159
Moniteau County						
I-435 Windbreak	90.2	1.1	0.6	6.8	1.3	609
Jackson County						
Average	82.4	6.7	0.7	4.3	5.9	470.2

Evaluation of Nitrogen and Fungicides for Control of Foliar Disease of Black Walnut

Anthracnose (Gnomonia leptostyla) and Mycosphaerella leaf spot (Mycosphaerella juglandis) prematurely defoliate eastern black walnut seedlings in most years at the George O. White State Nursery. Results from a study conducted last year suggested control of walnut leaf diseases with Benlate, and high applications of ammonium nitrate improved seedling quality. A moderate nitrogen level and a new fungicide were tested in 1989.

A split-plot experimental design with six replications and nitrogen treatments as the whole plots and fungicide treatments as split plots were used. Nitrogen treatments of 0 or 99 lbs. Nai/acre of ammonium nitrate (33-0-0) were applied 5 May with a Gandy spreader. Fungicide treatments were Benlate 50 DF (benomyl, Dupont Co.) at a rate of 1 lb/100 gal, Nova 40W (Rohm and Haas) at a rate of 4 oz/100 gal applied two or four times, and two untreated checks. Two application treatments were made on 15 June and 6 July. Four applications were made 15 June, 6 July, 27 July and 17 August. Fungicide plots were 20 ft. long with 3 ft. buffers between plots and applications were made with hand held sprayers until runoff. The trial was conducted in 4 ft. wide production beds fumigated and seeded to eastern black walnut the previous fall. In an attempt to control seedling density, a 7 ft. section in each fungicide plot was thinned to 7 seedlings/sq. ft. after seed was fully germinated. Phytophthora root rot caused significant mortality in the beds and final seedling density was 4.2 seedlings/sq. ft. in the thinned areas.

Beds were rated for leaf diseases on 31 August and 21 September. Rating of percentage leaflets infected was made with the scale of 0 = no infection, 1 = 1-10%, 2 = 11-25%, 3 = 26-50%, 4 = 51-80%, and 5 = 81-100%. The first five leaves on five randomly selected plants were rated. A defoliation rating was given to the entire 7 ft. thinned areas on 21 September with the scale 0 = no defoliation, 1 = 1-25% defoliated, 2 = 26-50% defoliated, 3 = 51-75% defoliated, 4 = 76-99% and 5 = 100 defoliated. No distinction between infection by Mycosphaerella leaf spot and anthracnose was made in infection ratings. Results were analyzed using analysis of variance, orthoganol contrasts and Duncan's multiple range test. Foliar disease was heavy in all plots due to frequent rains June through August. Check plots were starting to defoliate by the third week in August.

Nitrogen application reduced anthracnose severity, but not significantly. Four applications of Benlate was significantly better than all other fungicide treatments at both rating dates. On the 21 September evaluation, infection was so severe only the four Benlate treatments reduced anthracnose infection in comparison to controls. Contrasts showed four applications were significantly better than two applications of both fungicides at both rating dates.

Nitrogen application also did not significantly reduce premature defoliation. Contrasts showed Benlate reduced defoliation significantly more than Nova, four application of Nova were significantly better than two applications, and four applications of both fungicides (treatments combined) were better than two.

TABLE 1 - Average infection ratings made on 31 August on fungicide treatments for control of anthracnose and Mycosphaerella leaf spot on eastern black walnut seedlings. Rating scale is described in text. Means with a common letter are not significantly different according to Duncan's multiple range test.

Treatment	Infection Rating
Check	4.8a
Check	4.7a
Two applications Nova	3.7b
Four applications Nova	2.7c
Two applications Benlate	2.6c
Four applications Benlate	1.4d

Table 2 - Average defoliation ratings made on 21 September on fungicide treatments used to control anthracnose and Mycosphaerella leaf spot on eastern black walnut seedlings. Rating scale is described in text. Means with a common letter are not significantly different according to Duncan's multiple range test.

Treatment	Defoliation Rating
Check	3.8a
Check	3.7a
Two applications Nova	3.0a
Four applications Nova	1.9b
Two applications Nova	1.9b
Four applications Benlate	1.0b

Dogwood Anthracnose Survey

Fifteen counties were surveyed for dogwood anthracnose symptoms in July. Both natural and ornamental dogwoods were sampled in two tiers of counties from St. Louis county south to Pemiscot County.

Foliar symptoms similar to dogwood anthracnose, such as leaf spots and large necrotic blotches, were observed in all counties surveyed. Foliar infection was generally less than 10%, although scattered trees were near 100% infected. Infection of shoots and epicormic sprouts, branch and stem cankers, and dieback, which are typical of the disease in the eastern range of dogwood were not evident.

Lab verification of Discula from infected leaves was attempted by placing leaves in moist chambers or making isolations from infected leaves on acidified potato dextrose agar. Discula conidia and conidiomata were not confirmed from any of the samples. Phyllosticata sp., Aschocyta sp., Septoria cornicula, and Phomopsis sp. were common on infected leaves.

The survey found most dogwoods are in good health in the counties surveyed and failed to confirm Discula being present in Missouri. The survey will be conducted again next year.